



Calhoun: The NPS Institutional Archive
DSpace Repository

Theses and Dissertations

1. Thesis and Dissertation Collection, all items

1981-06

Performance of Navy service members
erroneously enlisted as a result of the
misnorming of ASVAB 6 and 7

Boyer, John F.

Monterey, California. Naval Postgraduate School

<http://hdl.handle.net/10945/20642>

Downloaded from NPS Archive: Calhoun



Calhoun is the Naval Postgraduate School's public access digital repository for research materials and institutional publications created by the NPS community. Calhoun is named for Professor of Mathematics Guy K. Calhoun, NPS's first appointed -- and published -- scholarly author.

Dudley Knox Library / Naval Postgraduate School
411 Dyer Road / 1 University Circle
Monterey, California USA 93943

<http://www.nps.edu/library>

PERFORMANCE OF NAVY SERVICE MEMBERS
ERRONEOUSLY ENLISTED AS A RESULT
OF THE MISNORMING OF ASVAB 6 & 7

John F. Boyer

NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

PERFORMANCE OF NAVY SERVICE MEMBERS
ERRONEOUSLY ENLISTED AS A RESULT
OF THE MISNORMING OF ASVAB 6 & 7

by

John F. Boyer

June 1981

Thesis Advisor:

Richard S. Elster

Approved for public release; distribution unlimited.

T199683



SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Performance of Navy Service Members Erroneously Enlisted as a Result of the Misnorming of ASVAB 6 & 7		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis June 1981
7. AUTHOR(s) John F. Boyer		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE June 1981
		13. NUMBER OF PAGES 46
		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) ASVAB (Armed Services Vocational Aptitude Battery) AFQT (Armed Forces Qualification Test) Norming, Mental Categories, Enlistment Standards, Performance.		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) In January 1976, the Armed Services Vocational Aptitude Battery (ASVAB) was adopted as the single DoD test to determine qualification for enlistment and eligibility for assignment to military occupations. Subsequent to the implementation of the ASVAB, analyses of the test's norming (i.e. conversion of raw scores to percentiles) were conducted which revealed a norming error. As a consequence, a potentially large number of individuals had been enlisted into the Armed Forces who would otherwise		



20. ABSTRACT continued

have been ineligible for military service had the test been correctly calibrated.

This study examines the performance of a sample of non-prior service males who, because of the misnorming of the ASVAB, were enlisted into the Navy. In terms of survival on active duty, completion of A-School, and attainment of paygrade E4 or higher, those individuals who were erroneously enlisted did not perform as well as those who would have been eligible regardless of the norming error.



Approved for public release; distribution unlimited.

Performance of Navy Service Members Erroneously
Enlisted as a Result of the Misnorming of ASVAB 6 & 7

by

John F. Boyer

Lieutenant Commander, Nurse Corps, United States Navy

B.S., Illinois State University, 1969

M.S., New York Medical College, 1973

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL

June 1981

ABSTRACT

In January 1976, the Armed Services Vocational Aptitude Battery (ASVAB) was adopted as the single DoD test to determine qualification for enlistment and eligibility for assignment to military occupations. Subsequent to the implementation of the ASVAB, analyses of the test's norming (i.e. conversion of raw scores to percentiles) were conducted which revealed a norming error. As a consequence, a potentially large number of individuals had been enlisted into the Armed Forces who would otherwise have been ineligible for military service had the test been correctly calibrated.

This study examines the performance of a sample of non-prior service males who, because of the misnorming of the ASVAB, were enlisted into the Navy. In terms of survival on active duty, completion of A-School, and attainment of pay-grade E4 or higher, those individuals who were erroneously enlisted did not perform as well as those who would have been eligible regardless of the norming error.



TABLE OF CONTENTS

I.	INTRODUCTION - - - - -	8
II.	PURPOSE- - - - -	12
III.	DATA AND METHODOLOGY - - - - -	14
IV.	FINDINGS - - - - -	19
V.	CONCLUSIONS- - - - -	37
APPENDIX A: MERGED DATA FILE VARIABLES- - - - -		41
APPENDIX B: VARIABLES CREATED FROM DATA FILE- - - - -		43
LIST OF REFERENCES - - - - -		44
INITIAL DISTRIBUTION LIST- - - - -		45



LIST OF TABLES

I.	ASVAB - AFQT: Raw Scores, Original Percentiles, Renormed Percentiles, and Mental Categories - - -	16
II.	Breakdown of the Total Sample by Mental Categories After Renorming- - - - -	20
III.	Eligibility/Ineligibility Frequencies in Mental Groups After Renorming- - - - -	21
IV.	A-School Involvement and Service Survival Rates Among Eligibles, by Mental Category - - - - -	25
V.	A-School Involvement and Service Survival Rates Among Ineligibles, by Mental Category - - - - -	26
VI.	Performance Measure Comparisons Between Eligibles and Ineligibles by Educational Background - - - -	27
VII.	Characteristics of "Successful" and "Non- successful" Ineligibles - - - - -	31
VIII.	Definition of Variables Utilized in Regression Analyses - - - - -	32
IX.	Stepwise Regression Results of Selected Variables Among Ineligibles - - - - -	34

LIST OF FIGURES

1.	Paygrade Attainment by Mental Category - - - - -	22
2.	Paygrade Attainment by Eligibility Group - - - - -	23
3.	Percentage of Paygrade by Educational Classification - - - - -	28
4.	Breakdown of "Successful" Service Members by Educational Background and Mental Category, with Associated Conditional Probabilities - Eligibles- - - - -	29
5.	Breakdown of "Successful" Service Members by Educational Background and Mental Category, with Associated Conditional Probabilities - Ineligibles- - - - -	30



I. INTRODUCTION

Current standards for entry into the Armed Services entail a variety of factors that are considered to be good predictors of success in the military. These standards are set so as to enable the Department of Defense to enlist the largest possible number of individuals who will be eligible for several types of training, who will successfully complete training courses, who will complete their first term of service, and who will be eligible to enter the career force. Since the end of World War II, Armed Forces entrance standards have included specified scores on certain paper and pencil aptitude tests. Such tests provide a reliable index of basic verbal and numeric skills, and hence serve as measures of general trainability. A variety of tests and alternate forms of these tests have been used for purposes of selection and classification, and an examination of these tests shows that they differ in many ways. Differences include content coverage, length, difficulty, time limitations, and scoring formulae. Consequently, the raw scores on one test cannot meaningfully be compared to those on another. Rather, meaningful comparison requires that the scores on different tests first be calibrated--or "normed"--to a common scale.



Norming is simply a method through which the raw scores on a test are converted to percentile scores. Raw scores by themselves are of very limited usefulness unless they are normed against the scores of a defined and relevant population. In the case of the enlistment entrance examination, the norms allow the Department of Defense to evaluate new recruits across time and across Services. If the norms established for replacement tests inaccurately translate raw scores to percentile scores, DoD cannot effectively evaluate its new recruits against those who served in the past, and further, enlistment standards may be inappropriately set [Ref. 1].

In 1950, the Armed Forces Qualification Test (AFQT) was introduced and adopted as the common test for DoD enlisted selection. It contained multiple-choice items dealing with vocabulary, arithmetic reasoning, and spatial perception. In 1960, a new version was implemented that included additional items on tool functions [Ref. 2]. AFQT percentiles were based upon the World War II mobilization population, and although there have been many successive versions of the test, AFQT scores continue to be normed back to the earliest version.¹

¹The World War II mobilization population is defined as the total officer and enlisted population serving in the military under mobilization conditions during WW II, as of 31 December 1944.

In January 1976, the Armed Services Vocational Aptitude Battery (ASVAB) was adopted as the single DoD test to determine qualification for enlistment and eligibility for assignment to military occupations [Ref. 3]. The initial version of the ASVAB (Forms 6 and 7) contained 13 subtests, of which three--Word Knowledge, Arithmetic Reasoning, and Space Perception--comprised the AFQT. These and other of the subtests were also used (as they are today) in various aptitude composites as measures of cognitive abilities and areas of vocational interest.

Shortly after implementation of ASVAB 6/7, there were indications that the norming of the AFQT portion was not sufficiently accurate at the upper ability levels. Based upon studies performed by researchers from the various Service Branches, new conversion tables were adopted during 1976 which increased the number of AFQT items that had to be passed to qualify in the upper third of the score range. Further analysis of the ASVAB norms was subsequently conducted by the Center for Naval Analyses (CNA), and these efforts indicated that the operational norms overestimated ability at the low end of the score range [Ref. 4, 5]. Since the two studies carried out by CNA were based solely on Marine recruits, the Office of the Secretary of Defense (OSD) directed that additional study be undertaken on applicants for enlistment from all Services. This analysis was conducted by the Army



Research Institute, and it corroborated findings that a significant misnorming problem existed in the lower ranges of ASVAB 6 and 7 [Ref. 3]. Consequently, a number of corrective actions were promptly implemented, such as the establishment of corrected norms and the introduction of a new version of ASVAB free of compromise and norming error. Nevertheless, there remained the need to determine what impact the norming problem had on the ability of DoD to man its forces effectively. The realization that accessions during the relevant years had included a much larger proportion than had been believed of individuals in the lowest acceptable mental category raised the concern that the Services may have enlisted a large number of people who were unable to perform their jobs acceptably. For example, it has been estimated that roughly 25 percent of all Army accessions accepted between January 1976 and September 1980 would not have been eligible to enlist had the test scores been normed correctly [Ref. 6].

II. PURPOSE

Although certain military authorities such as former Army Secretary Clifford Alexander contend that there is no relationship between job performance and AFQT scores, most others conclude that they are directly and strongly correlated [Ref. 6]. A major difficulty in reaching a consensus on this issue arises from the fact that currently there is no acceptable, practical method in the military of measuring an individual's job performance [Ref. 7]. However, a variety of factors that have some logical relationship to performance are often utilized as indicators of quality.

This research effort, therefore, was aimed at evaluating how those individuals who would have been ineligible for enlistment had the tests been normed correctly are, in fact, performing their military duties. The hypothesis was simply that on measures of overall job performance, these Service members would demonstrate less desirable patterns than would others in the same accession year group who would have been eligible for enlistment regardless of the norming error. In particular, attention was directed toward that group of individuals whose renormed scores deemed them eligible at only the lowest acceptable margins. This was done in an attempt to



examine the appropriateness of the level of performance on the AFQT that is considered "minimally acceptable" for enlistment.



III. DATA AND METHODOLOGY

The sample for analysis in this study was composed of 12,781 non-prior service males whose term of enlistment was from three to six years and who began their first term in the Navy during the last quarter (i.e. July, August, September) of fiscal year 1977.

The data base was drawn from the Enlisted Master Record (EMR) and the Enlisted Survival Tracking File-Longitudinal (STF-L). The latter is produced jointly by the Naval Personnel Research and Development Center (NPRDC) and the Naval Manpower and Personnel Command (NMPC).

AFQT percentile scores received by individuals at the time of enlistment were obtained from the STF-L, and in the case of this sample, these values reflected the mis-norming problem. Raw aptitude scores obtained by each individual were extracted from the EMR so that the effects of renorming could be determined. That is, individuals who would not have been eligible for enlistment if the test had been correctly calibrated could be identified. Raw scores on the Arithmetic Reasoning, Word Knowledge, and Space Perception subtests were totaled, and this sum was then converted to the corresponding, renormed AFQT percentile.

Frequently, AFQT scores are also grouped into five broad categories (and often into even more well-defined subcategories) relative to the degree of trainability of the individual. These categories are most commonly referred to as "mental groups", with Category I including those individuals who are considered to possess the highest degree of trainability on the basis of their test scores. Table I presents a breakdown of raw scores, the originally-associated percentiles, and the designated ranges of the various trainability categories.

Currently, by law, no Category V individuals (i.e. an AFQT percentile of less than 10) are enlisted into the Armed Services, and those scoring in the Category IV range are considered eligible only if they possess a high school diploma. Additionally, Navy enlistment standards require a minimum AFQT percentile score of 17 (i.e. a raw score of 31). Therefore, based on these criteria, members of the sample who would have been ineligible for enlistment had the ASVAB 6/7 been correctly normed were identified.

Subsequent to identification of the actual "ineligibles", a comparison of this group with those in the remainder of the sample (i.e. "eligibles") was made in terms of performance in the Navy. Additionally, performance of individuals in the various mental categories was also examined. In the absence of a single acceptable measure, several indicators that have a logical

Table I

ASVAB 6/7 - AFQT : RAW SCORES, ORIGINAL PERCENTILES,
RENORMED PERCENTILES, AND MENTAL CATEGORIES

Raw Score	Percentiles		Mental Category	Raw Score	Percentiles		Mental Category
	Orig.	Renormed			Orig.	Renormed	
1-15	1	1	V	46	67	50	III A
16	3	1		47	69	53	
17	3	2		48	71	56	
18	3	3		49	74	58	
19	4	4		50	75	60	
20	6	5		51	77	62	
21	7	6		52	79	65	
22	8	7		53	80	67	
23	9	9		54	82	70	
24	11	10		55	84	72	
25	13	11	IV C	56	85	75	II
26	17	12		57	87	77	
27	18	13		58	88	80	
28	21	14		59	89	82	
29	21	15		60	92	84	
30	25	16	IV B	61	93	86	
31	30	17		62	94	87	
32	33	18		63	95	89	
33	36	19	IV A	64	96	91	
34	38	21		65	97	93	I
35	42	23		66	98	95	
36	43	25		67	98	97	
37	45	27		68	99	98	
38	48	29		69	99	99	
39	49	31	III B	70	99	99	
40	54	33					
41	58	35					
42	60	38					
43	62	41					
44	64	44					
45	65	47					

Source: Lockman, R. and Rutledge, K. AFQTease. Alexandria, Virginia: Center for Naval Analyses, February 1981, pp. C-4, D-6.

(although recognizably imperfect) relationship with performance were assessed. These indicators included the following:

1. Promotion pattern. An examination of average Navy promotion rates suggests that individuals who entered the military in the fourth quarter of fiscal year 77 should reach at least paygrade E4 by the third quarter of fiscal year 80, the time interval covered by the data base [Ref. 8].
2. Involvement in occupational skill training. After completing initial basic training, approximately 70 percent of members entering the Navy attend an A school. Successful completion of such training is generally considered to be a milestone in career development.
3. Service survival. Attrition is another measure of performance. Therefore, attrition and its relationship to AFQT scores must be examined.

These factors are not the only indicators of the quality of performance, however, overall they should provide an adequate basis from which to draw implications about the relationships between AFQT scores and an individual's ultimate success in military service.

These performance "proxies" were measured by means of variables, or combinations of variables, extracted from the STF-L. Crosstabulations were then carried out to establish comparisons among the "real" eligibles and ineligibles, as well as among members of all renormed mental categories. Secondly, since educational background is often considered to be a strong indicator of successful job performance, the sample was also analyzed in terms of the performance measures by educational attainment prior to enlistment. Finally, in an attempt to differentiate "successful" and "unsuccessful" ineligibles, regression analyses were conducted utilizing the variables as described in Table VIII.

IV. FINDINGS

Utilizing renormed AFQT percentiles and other current Navy enlistment standards, 1,581 recruits of the original sample were determined to have been actually ineligible for enlistment into military service, while 11,200 would have been eligible regardless of the norming error.

Table II identifies the number of individuals who are included in each of the mental categories, both before and after renorming, and the percentage of the total sample each group represents. Especially noteworthy relative to this study is that prior to the renorming of the test scores only 3.1 percent of the sample were categorized in the lowest mental groups (i.e. IV and V). However, after the scores were correctly calibrated, nearly one fourth of the individuals in the sample were so classified.

Table III identifies the number of individuals in each mental group who were considered eligible and ineligible after renorming.

Figure 1 presents comparisons among the mental groups in paygrade attainment, while Figure 2 illustrates the findings for a corresponding comparison between the eligibles and ineligibles of the sample.

Tables IV and V present the results of similar comparisons for Service survival rates and A-School

Table II

BREAKDOWN OF THE TOTAL SAMPLE BY MENTAL CATEGORIES
BEFORE AND AFTER RENORMING

Mental Category	Before Renorming		After Renorming	
	N	Percentage	N	Percentage
I	741	5.8	566	4.4
II	3377	26.4	3477	27.2
III A	3915	30.6	2491	19.5
III B	4329	33.9	3061	23.9
IV A	353	2.8	1974	15.4
IV B	18	.1	878	6.9
IV C	17	.1	247	1.9
V	13	.1	87	.7
Total	12,781	100 ¹	12,781	100 ¹

¹Discrepancy due to rounding.

Table III

ELIGIBILITY/INELIGIBILITY FREQUENCIES IN MENTAL GROUPS
AFTER RENORMING

Mental Category	Eligible ¹	Ineligible
I	566	0
II	3477	0
III A	2491	0
III B	3061	0
IV A	1081	893
IV B	524	354
IV C	0	247
V	0	87
Total	11,200	1,581

¹Eligible = AFQT(raw) $\geq$ 39, or $31 \leq$ AFQT(raw) $\leq$ 38 plus a high school diploma

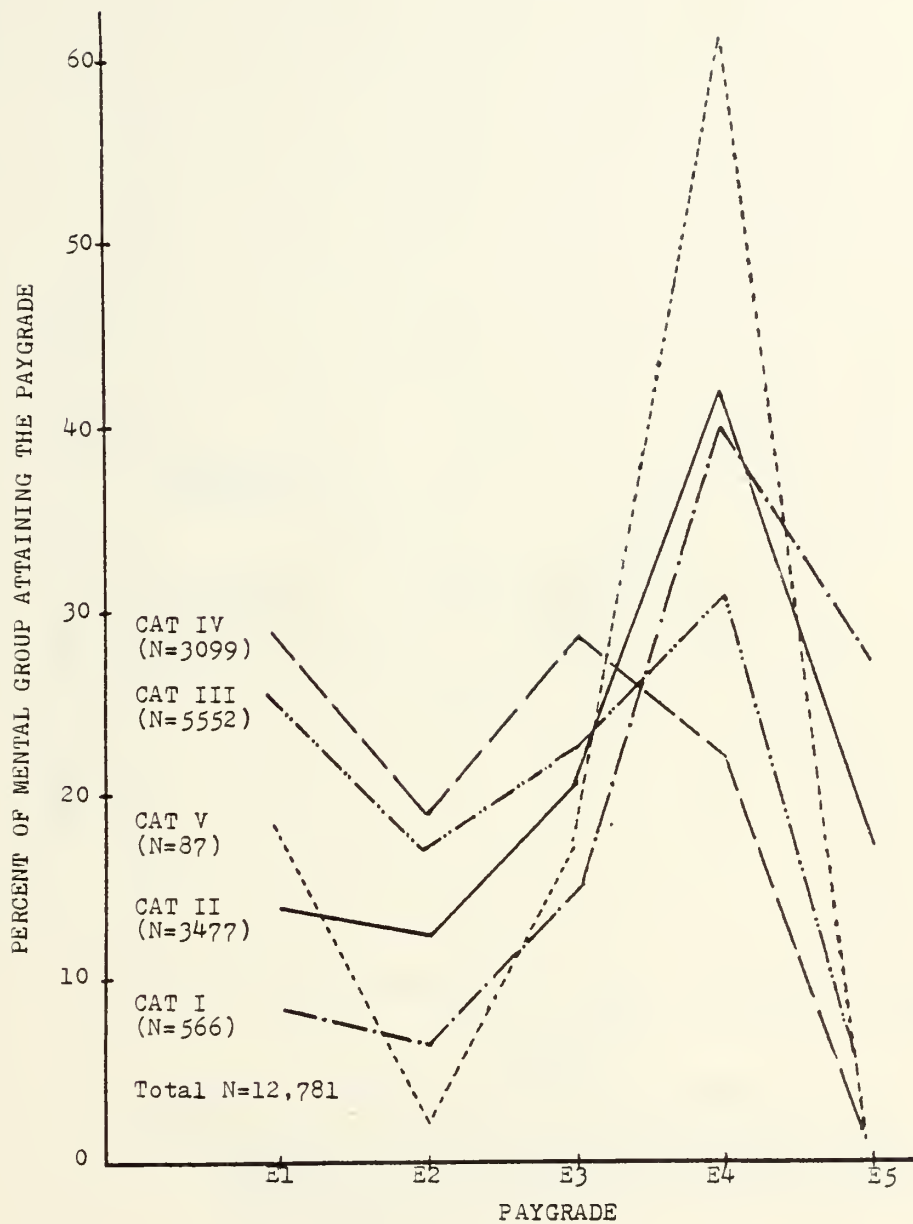


Figure 1. PAYGRADE ATTAINMENT BY MENTAL CATEGORY

Note. Sample is all male, non-prior service, 3 to 6 year enlistees entering the Navy during July-Sep FY77. All individuals had length of service of 33 months at end of time frame covered by the data base.

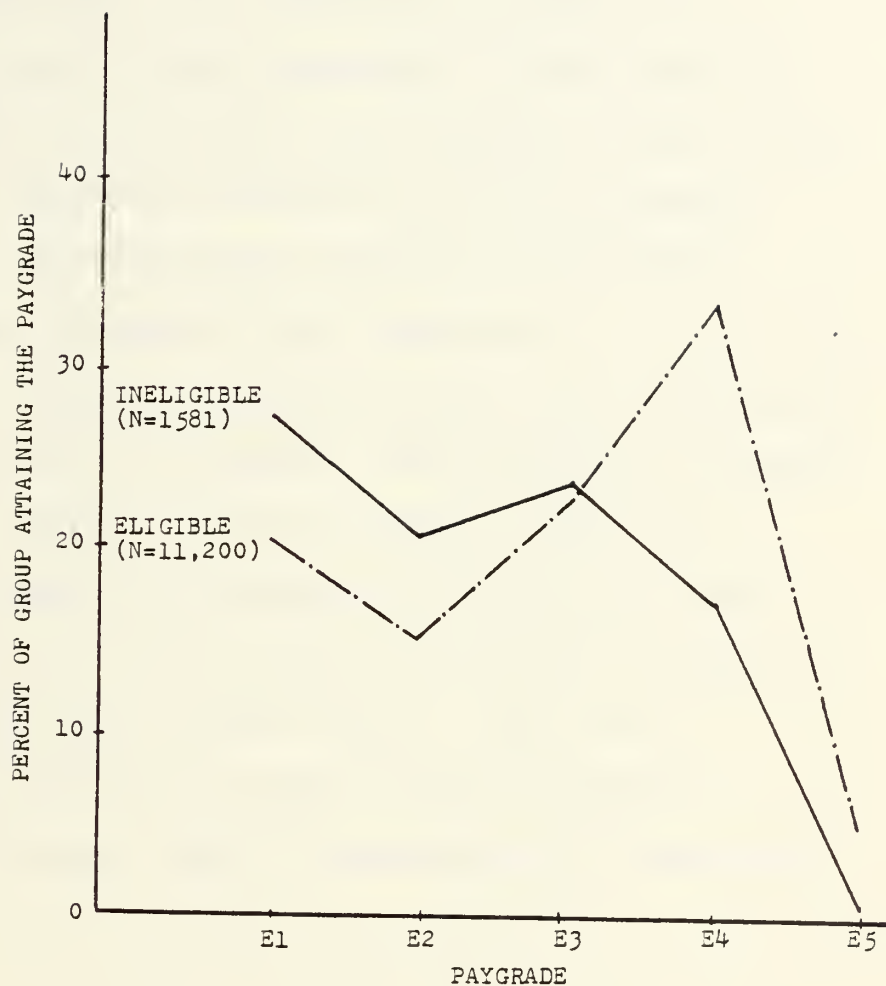


Figure 2. PAYGRADE ATTAINMENT BY ELIGIBILITY GROUP

Note. Sample is all male, non-prior service, 3 to 6 year enlistees entering the Navy during July-Sep FY77. All individuals had length of service of 33 months at the end of the time frame covered by the data base.

Eligible = $AFQT(raw) \geq 39$, or $31 \leq AFQT(raw) \leq 38$ plus a high school diploma or certificate of General Educational Development.

attendance among eligibles, ineligibles, and the mental groups.

The results of the analysis of the performance of eligibles and ineligibles, classified in terms of educational attainment, are presented in Table VI.

Figure 3 identifies the percentage of each paygrade attained by the various educational classifications, while Figures 4 and 5 provide breakdowns of the "successful" Service members by educational background and mental category for both eligibles and ineligibles.

Table VII describes characteristics of the "successful" and "non-successful" ineligibles, where success is defined as achieving a paygrade of E4 or higher, completing A-School, and remaining on active duty during the time interval covered by the data base (i.e. Fourth quarter of FY77 through the Third quarter FY80). Table VIII describes the variables utilized in the regression analyses, and finally, Table IX summarizes the regression findings.

Table IV

A-SCHOOL INVOLVEMENT AND SERVICE SURVIVAL RATES AMONG
ELIGIBLES¹ BY MENTAL CATEGORY

Mental Category	N	A-School Involvement				Current Students ³	Service Survival Rate ⁴
		Graduated	Failed to Complete	Success Rate ²	% of Category Completing Training		
I	566	404	37	.916	71	3	.77
II	3477	2194	110	.952	63	28	.76
III A	2491	1234	82	.938	50	18	.69
III B	3061	1155	88	.929	38	21	.65
IV A	1081	369	36	.911	34	2	.74
IV B	524	105	13	.900	20	2	.74
IV C	0	0	0	-	-	0	-
V	0	0	0	-	-	0	-
Total	11200	5461	366	.937	49	74	

¹Eligible = $AFQT(raw) \geq 39$, or $31 \leq AFQT(raw) \leq 38$ plus a high school diploma

²Proportion of individuals who began training that graduated.

³Number of individuals engaged in training at the end of the time interval covered by the data base

⁴Proportion of the mental category subgroup remaining on active duty at the end of the time interval covered by the data base.

Table V

A-SCHOOL INVOLVEMENT AND SERVICE SURVIVAL RATES AMONG
INELIGIBLES¹ BY MENTAL CATEGORY

Mental Category	N	A-School Involvement				Current Students ³	Service Survival Rate ⁴
		Graduated	Failed to Complete	Success Rate ²	% of Category Completing Training		
I	0	0	0	-	-	0	-
II	0	0	0	-	-	0	-
III A	0	0	0	-	-	0	-
III B	0	0	0	-	-	0	-
IV A	893	131	12	.916	15	2	.52
IV B	354	47	2	.959	13	0	.57
IV C	247	30	8	.789	12	1	.70
V	87	33	5	.868	38	1	.80
Total	1581	241	27	.899	15	4	

¹Ineligible = AFQT(raw) ≤ 30 , or $31 \leq$ AFQT(raw) ≤ 38 and no high school diploma

²Proportion of individuals who began training that graduated.

³Number of individuals engaged in training at the end of the time interval covered by the data base.

⁴Proportion of the mental category subgroup remaining on active duty at the end of the time interval covered by the data base.

Table VI

PERFORMANCE MEASURE COMPARISONS BETWEEN ELIGIBLES AND
INELIGIBLES BY EDUCATIONAL BACKGROUND

	N	Service Survival Rate ¹	% of group completing A-School ²
ELIGIBLES ³			
High school graduates	7371	.79	57
GED Certificate holders ⁴	889	.58	39
Non-high school graduates	2771	.55	29
Other ⁵	169		
INELIGIBLES			
High school graduates	390	.75	19
GED Certificate holders	12	.33	17
Non-high school graduates	1144	.51	14
Other	35		
Total	12,781		

¹Reflects the proportion of the eligibility subcategory (e.g. ineligible high school graduates) who have remained on active duty during the time frame covered by the data base.

²Reflects the percentage of the total subcategory (i.e. the denominator includes both those who attended A-School as well as those who did not).

³Eligible = $AFQT(\text{raw}) \geq 39$, or $31 \leq AFQT(\text{raw}) \leq 38$ plus a high school diploma or Certificate of GED.

⁴GED = General Educational Development

⁵Includes individuals whose educational background involves a variety of alternatives such as vocational training.



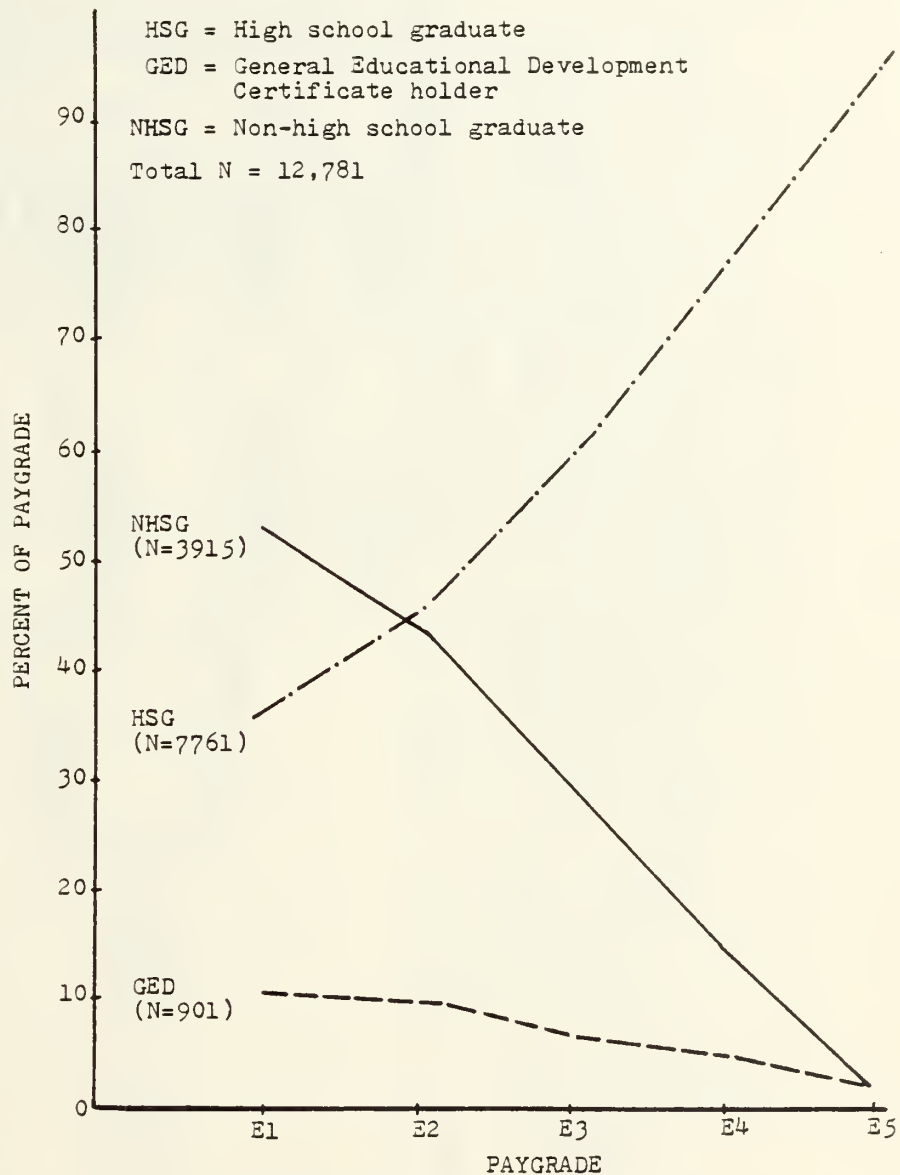


Figure 3. PERCENTAGE OF PAYGRADE BY EDUCATIONAL CLASSIFICATION (Total sample)

Note. Sample is all male, non-prior service, 3 to 6 year enlistees entering the Navy during July-Sep FY77.

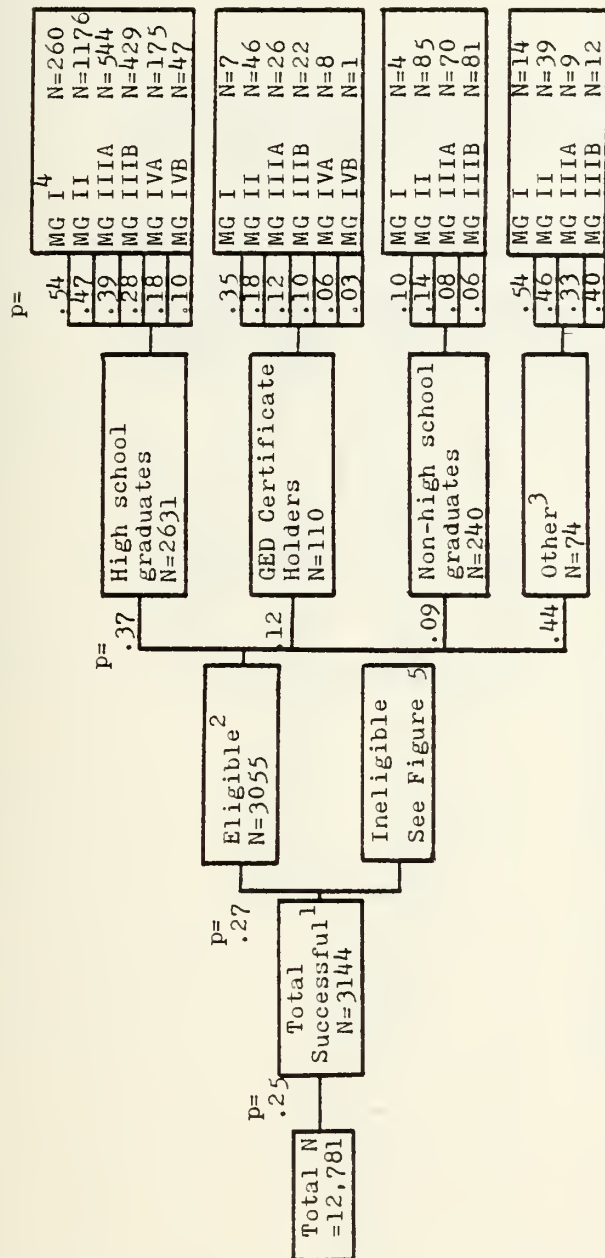


Figure 4. BREAKDOWN OF "SUCCESSFUL" SERVICE MEMBERS BY EDUCATIONAL BACKGROUND AND MENTAL CATEGORY, WITH ASSOCIATED CONDITIONAL PROBABILITIES - ELIGIBLES

¹Success = attainment of paygrade E4 or higher, completion of A-School, and survival on active duty as of 1 July 1980. All probabilities are conditional in nature. For example, if eligibility for enlistment, high school graduation and Mental Group II are given, the probability of success in the Navy is .47. Similarly, the probability of success of an individual in Mental Group IIIB is .06 if he is also a non-high school graduate and eligible for enlistment.

²Eligible = AFQT(raw) $\geq$ 39, or $31 \leq$ AFQT(raw) $\leq$ 38 plus a high school diploma or certificate of General Educational Development.

³Other includes a variety of alternatives such as vocational training.

⁴All Mental Groups are based upon renormed AFQT scores.

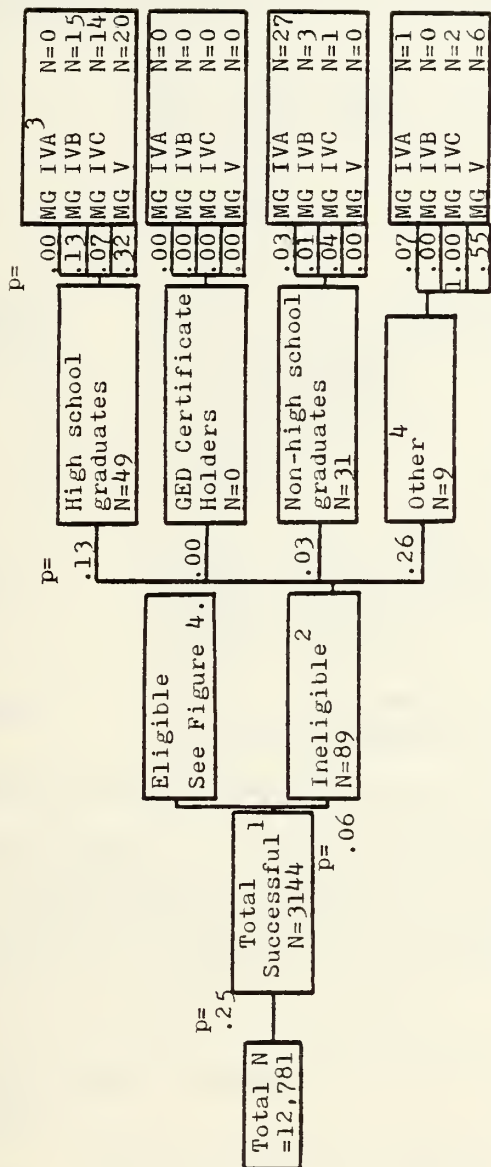


Figure 5. BREAKDOWN OF "SUCCESSFUL" SERVICE MEMBERS BY EDUCATIONAL BACKGROUND AND MENTAL CATEGORY, WITH ASSOCIATED CONDITIONAL PROBABILITIES - INELIGIBLES

¹Success = attainment of paygrade E4 or higher, completion of A-School, and survival on active duty as of 1 July 1980. All probabilities are conditional in nature. For example, if ineligibility for enlistment, high school graduation and Mental Group IVB are given, the probability of success in the Navy is .13. Similarly, the probability of success of an individual in Mental Group IVA is .03 if he is also a non-high school graduate and ineligible for enlistment.

²Ineligible = AFQT(raw) $\leq$ 30, or $31 \leq$ AFQT(raw) $\leq$ 38 and no high school diploma or certificate of General Educational Development.

³All Mental Groups are based upon renormed AFQT scores.

⁴Other includes a variety of alternatives such as vocational training.

Table VII
CHARACTERISTICS OF "SUCCESSFUL" AND
"NON-SUCCESSFUL" INELIGIBLES¹

Characteristic	Classification	Successful (N=89)		Non-successful (N=1492)	
		N	%	N	%
Age ²	17 years old	6	07	165	11
	18 - 19 years old	40	45	958	64
	20 years or older	43	48	369	25
Race	Caucasian	44	49	1094	73
	Minority	45	51	398	27
Educational background	High school graduates	49	55	341	23
	Non- high school graduates	31	35	1113	74
	GED Certificate holders	0	0	12	1
	Other ³	9	10	26	2
Mental category	Mental Group IVA	28	32	866	58
	Mental Group IVB	18	20	336	23
	Mental Group IVC	17	19	230	15
	Mental Group V	26	29	61	4
Dependency status	With dependents	58	65	340	23
	Without dependents	31	35	1153	77

¹Successful = Attained paygrade E4 or higher, completed A-School, and did not attrite. Ineligible = AFQT(raw) $\leq$ 30, or $31 \leq$ AFQT(raw) $\leq$ 38 and no high school diploma or certificate of General Educational Development.

²Age at time of accession.

³Includes a variety of alternatives such as vocational training.

Note. Total N (Ineligibles) = 1581.

Table VIII

DEFINITION OF VARIABLES UTILIZED IN REGRESSION ANALYSES

Variable	Definition
ATTRITE	1 - Individual remained on active duty as of 1 July 1980 0 - Individual was lost from active duty prior to 1 July 1980
PPG	1 - Individual had attained a paygrade of E4 or higher as of 1 July 1980 0 - Individual had not attained a paygrade of E4 or higher by 1 July 1980
ASI	1 - Individual is an A-School graduate 0 - Individual is not an A-School graduate
RACE	1 - Individual is a caucasian 0 - Individual is a minority
AGE1	1 - Individual was less than 17 years old at the time of enlistment 0 - Individual was not less than 17 years old at the time of enlistment
AGE2	1 - Individual was 17 years old at the time of enlistment 0 - Individual was not 17 years old at the time of enlistment
AGE4	1 - Individual was 20 years of age or older at the time of enlistment 0 - Individual was not 20 years of age or older at the time of enlistment
DEP	1 - Individual did not have dependents 0 - Individual had dependents
NHSG	1 - Individual is a non-high school graduate and does not hold a Certificate of General Educational Development 0 - Individual is a high school graduate

Table VIII (continued)

DEFINITION OF VARIABLES UTILIZED IN REGRESSION ANALYSES

Variable	Definition
GED	1 - Individual holds a Certificate of General Educational Development 0 - Individual does not hold a Certificate of General Educational Development
OTH	1 - Individual's educational background included one of a variety of alternatives such as vocational training 0 - Individual's background did not include one of the variety of educational alternatives
CATV	1 - Individual is categorized in Mental Group V 0 - Individual is not categorized in Mental Group V
CATIVC	1 - Individual is categorized in Mental Group IVC 0 - Individual is not categorized in Mental Group IVC
CATIVB	1 - Individual is categorized in Mental Group IVB 0 - Individual is not categorized in Mental Group IVB

Note: Mental categories are based upon renormed AFQT scores.

The regression constant includes ages 18-19 years, high school graduates, and Mental Group IVA personnel.

Table IX
STEPWISE REGRESSION RESULTS OF SELECTED VARIABLES¹
AMONG INELIGIBLES² (N=1581)

Independent Variables	Dependent Variable		
	Service Survival ³	A-School Completion	E4 Attainment
Regression Coefficients			
AGE1	---	---	---
AGE2	---	---	---
AGE4	---	---	---
CATV	---	.1596*	.2613*
CATIVC	---	---	---
CATIVB	---	---	---
DEP	-.0918*	---	-.0921*
RACE	---	---	---
GED	-.3940*	---	-.2271*
NHSG	-.2318*	-.0839*	-.2515*
OTH	---	---	.1702*
CONSTANT	.8491	.2668	.4447
R ²	.0589	.0320	.1482
F Statistic	10.9307	7.4195	30.3610

* indicates significance at the $p \leq .01$ level

¹See Table VIII for definitions of variables utilized in the regression.

²Ineligible = AFQT(raw) ≤ 30 , or $31 \leq$ AFQT(raw) ≤ 38 and no high school diploma or certificate of General Educational Development.

³The dependent variable utilized for Service Survival was ATTRITE where 1 = remained on active duty as of 1 July 1980 and 0 = lost from active duty prior to 1 July 1980.

⁴The basis of this variable is the entire group of ineligible, not just those who attend A-School. The dependent variable utilized was ASI where 1 = an A-School graduate and 0 = not an A-School graduate.

⁵The dependent variable utilized for E4 Attainment was PPG where 1 = paygrade of E4 or higher was attained and 0 = paygrade of E4 or higher was not attained.

⁶--- indicates non-significant variable.



The results of the regression for the sample of ineligible may therefore be summarized as follows.

In terms of Service survival:

- A. Individuals without dependents had, on average, a nine percent lower survival rate than did those personnel with dependents.
- B. Individuals who held Certificates of General Educational Development had, on average, a 39% lower chance of survival than did high school graduates.
- C. Non-high school graduates, on average, had a 23% lower survival rate than did high school graduates.

In terms of A-School completion:

- A. Mental Category V personnel had, on average, a 16% better chance of completing A-School than those individuals who were categorized in Mental Group IVA.
- B. On average, non-high school graduates had an eight percent lower chance of completing A-School than did high school graduates.

In terms of E4 attainment:

- A. Mental Category V personnel had, on average, a 26% better chance of attaining a paygrade of E4 than those ineligible in Mental Group IVA.

- B. Individuals without dependents had, on average, a nine percent lower chance of attaining a paygrade of E4 than did those personnel with dependents.
- C. Both those individuals who held Certificates of General Educational Development and non-high school graduates had a lower chance of attaining a paygrade of E4 (by 23% and 25% respectively) than did high school graduates.
- D. Those individuals whose educational background included an alternative to traditional high school programs (e.g. vocational training) had, on average, a 17% better chance of attaining a paygrade of E4 than did high school graduates.

V. CONCLUSIONS

In general, the individuals in this sample who were erroneously enlisted into the Navy, due to the misnorming of ASVAB 6 and 7, have not performed as well as those who would have been eligible for enlistment regardless of the calibration error. Of the 1,581 individuals in the sample who were determined to have been ineligible for military service after renorming, only 89 were found to be successful overall in terms of paygrade attainment, Service survival, and A-School completion. Attrition was greater among the ineligibles than among the group of eligibles as a whole, as well as than among the individuals in only the next higher mental categories. Similarly, a notably lower percentage of each mental category among the ineligibles completed A-School, and finally, their rates of promotion in paygrade were far less desirable. Interestingly, however, when the sample was delineated by mental groups, ineligible individuals in Category V performed better on the basis of these indicators than other of the ineligibles. Nevertheless, it is important to note that the number of individuals in Category V (N=87) was smaller than those in other mental groups, so perhaps such results would not be elicited from a larger sample.

Educational background likewise appeared to have a positive relationship with performance. On the basis of the data from this study sample, high school graduates were promoted at higher rates, had a higher probability of completing A-School, and in general, possessed a higher rate of survivability than either GED Certificate holders or non-high school graduates. Again, however, it is important to note that there were only 12 ineligible GED Certificate holders, so the results may be somewhat unreliable in this subcategory.

The attempt to differentiate "successful" and "unsuccessful" ineligibles in terms of the variables utilized in the regression analyses was only marginally successful. In terms of all three performance measures (i.e. Service survival, E4 attainment and A-School completion), lack of a high school diploma was determined to be a significant predictor. On the basis of this sample, non-high school graduates appear to be less likely to succeed in the Navy. Similarly, those individuals who held certificates of General Educational Development were also less successful than high school graduates relative to Service survival and E4 attainment, as were those ineligibles without dependents. Finally, categorization in Mental Group V appeared to have a positive impact on graduating from A-School and attaining the appropriate paygrade. Again, however, because of the small number of

individuals in this group (N=87), similar results may not be seen with a larger sample.

Thus, although the misnorming of ASVAB 6 and 7 has generated concern on the part of military authorities, it has nonetheless provided a natural experiment by which current enlistment standards might be examined. This study demonstrates that in general, on the basis of the indicators of performance that were considered, individuals who are screened out of enlistment in the Navy on the basis of their aptitude scores do not perform as well as those considered eligible for enlistment into the military environment. Certainly other factors such as the Service member's reenlistment quality code, separation code, completion of term of enlistment indicator, and supervisory ratings would also provide valuable information relative to job performance. Since the vast majority of the sample employed in this study had not as yet completed their first term of enlistment during the time frame covered by the data base, such information was not available. Nevertheless, the trends identified in terms of paygrade attainment (promotion pattern), occupational training (A-School), survival and educational background certainly suggest that if quantitative recruitment goals can continue to be met, current enlistment standards should not be lowered.



Additionally, this study indicates that further research might be worthwhile in the area of those individuals whose educational backgrounds include one of the variety of alternatives to traditional high school programs such as vocational training. Although the number of individuals in this educational subcategory was small in this study, the proportion of the group who were "successful" is comparatively high which suggests such persons might be prime recruiting candidates.



APPENDIX A

MERGED DATA FILE VARIABLES

SSN	Social Security Number
AODFY	As-of Date - Fiscal Year
AODQ	As-of Date - Quarter
AODC	As-of Date - Count
SON	Strength Indicator
*SEX	Sex
*RACE	Race
*ETH	Ethnic Group
DOB	Date of Birth
AFQT	Armed Forces Qualification Test Score
HYEC	Highest Year of Education Completed
*EC	Education Code
ASI	A-School Indicator
*DEP	Dependency Status
TERM	Term of Enlistment
*TYPE	Type of Enlistment
*STATUS	Term Status
NOE	Number of Enlistments
ACQ	Type of Acquisition
PROG	Type of Program
*SOG	Special Program Code
BR	Branch/Class
RADOM	Reserve Active Duty Obligation - Months
ED	Enlisted Designator
PRC	Present Rate Code
*PPG	Present Paygrade
*PNEC	Primary Navy Enlisted Classification
*SNEC	Secondary Navy Enlisted Classification
ADSD	Active Duty Start Date
PEBD	Pay Entry Base Date
CED	Current Enlistment Date
CADD	Current Active Duty Date
EAOS	Expiration of Active Obligated Service
SOFT	Soft EAOS
*EAOSCI	EAOS Change Indicator
*OAUC	Onboard Actual Unit Identification Code
OACC	Onboard Accounting Category Code
SEA	Onboard Sea/Shore Code
OTD	Onboard Transfer Date
*PAUC	Past Actual Unit Identification Code
*SRBRI	Selective Reenlistment Bonus Received Indicator

* Indicates alphanumeric characters



*SRBZ	Selective Reenlistment Bonus Zone
*SRBSI	Selective Reenlistment Bonus Skill Indicator
*SRBA	Selective Reenlistment Bonus Award Level
*RQC	Reenlistment Quality Code
LOSSD	Loss Date of Occurrence
*CODEN	Loss Code - Navy
*CODEDOD	Loss Code - Department of Defense
TFORM	ASVAB Test Form
GI	ASVAB Subtest - General Information
NO	- Numerical Operations
AD	- Attention to Detail
WK	- Word Knowledge
AR	- Arithmetic Reasoning
SP	- Space Perception
MK	- Mathematics Knowledge
EI	- Electronics Information
MC	- Mechanical Comprehension
GS	- General Science
SI	- Shop Information
AI	- Automotive Information

* Indicates alphanumeric characters

APPENDIX B
VARIABLES CREATED FROM DATA FILE

RAW	Raw AFQT Score
CAT	Mental Category, after renorming
AGE	Age of Service Member in Years
ELIG	Eligibility
ATTRITE	Survival Status

Recoded:

EC	Educational Code
PPG	Present Paygrade
RACE	Race
DEP	Dependency Status
CODEN	Loss Code - Navy

LIST OF REFERENCES

1. Aptitude Testing of Recruits: A Report to the House Committee on Armed Services. Office of the Assistant Secretary of Defense (MRA&L), July 1980.
2. Lockman, R. and Rutledge, K., AFQTease. Alexandria, Virginia: Center for Naval Analyses, February 1981.
3. Maier, M. and Grafton, F., Renorming ASVAB 6/7 at Armed Forces Entrance and Examination Stations. Technical Memorandum 80-1. Directorate for Accession Policy, Office of the Secretary of Defense, August 1980.
4. Sims, W., An Analysis of the Normalization of the Armed Services Vocational Aptitude Battery (ASVAB) Forms 6 and 7. CNS 1115. Alexandria, Virginia: Center for Naval Analyses, April 1978.
5. Sims, W., A Reexamination of the Normalization of the Armed Services Vocational Aptitude Battery (ASVAB) 6A, 7B, 6E and 7E. CNA Working Paper 79-3059. Alexandria, Virginia: Center for Naval Analyses, 30 May 1979.
6. Philpot, T., "'80 Test Scores Show Drop in Recruit Quality." Navy Times, 9 February 1981.
7. Report to the Secretary of Defense on Implementation of the New Armed Services Vocational Aptitude Battery and Actions to Improve the Enlistment Standards Process. Washington, D.C: Office of the Assistant Secretary of Defense (MRA&L), 1 December 1980.
8. Department of the Navy. Advancement Manual, BUPERS Instruction 1430.16A, Chapter 807, 23 December 1977.

INITIAL DISTRIBUTION LIST

	No. Copies
1. Defense Technical Information Center Cameron Station Alexandria, Virginia 22314	2
2. Defense Logistics Studies Information Exchange U.S. Army Logistics Management Center Fort Lee, Virginia 23801	2
3. Library, Code 0142 Naval Postgraduate School Monterey, California 93940	2
4. Department Chairman, Code 54 Department of Administrative Science Naval Postgraduate School Monterey, California 93940	1
5. Professor Richard S. Elster, Code 54Ea Department of Administrative Science Naval Postgraduate School Monterey, California 93940	5
6. Professor Frank Harding, Code 54 Department of Administrative Science Naval Postgraduate School Monterey, California 93940	1
7. Office of the Secretary of Defense Deputy Assistant Secretary of Military Personnel Policy Director Accession Policy The Pentagon Washington, D.C. 20301	1
8. Office of the Secretary of Defense Deputy Assistant Secretary of Military Personnel Policy Director Enlisted Personnel Management The Pentagon Washington, D.C. 20350	1

	No. Copies
9. Assistant Secretary of the Navy Manpower, Reserve Affairs and Logistics The Pentagon Washington, D.C. 20350	1
10. Deputy Chief of Naval Operations (Manpower, Personnel and Training) Chief of Naval Personnel, OP-01 Arlington Annex Columbia Pike and Arlington Ridge Road Arlington, Virginia 20370	1
11. Commanding Officer Naval Personnel Research and Development Center San Diego, California 92152	1
12. Dr. Robert Lockman Center for Naval Analyses 2000 Beauregard Alexandria, Virginia 22311	1
13. LCDR John F. Boyer 12 Gillespie Lane Monterey, California 93940	1



NOV 29 1994
FEB - 6 1995

Thesis

B7929

Boyer

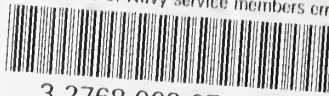
193794

c.1

Performance of Navy
service members erro-
neously enlisted as a
result of the mis-
norming of ASVAB 6 &
7.

thesB7929

Performance of Navy service members erro



3 2768 002 07403 1

DUDLEY KNOX LIBRARY

7